IN THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a floating gate operably positioned proximate to and separated from the channel region;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including a mixture of component oxides having varied concentrations to provide a composition gradient across the thickness and provide different barrier heights with respect to the floating gate and the control gate, the component oxides including at least one metal oxide;

wherein the intergate insulator barrier height is lower at the floating gate and is higher at the control gate.

2. (Original) The device of claim 1, wherein the floating gate is separated from the channel region by an oxide layer.

3. (Original) The device of claim 1, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the floating gate and the intergate insulator.

4. (Currently Amended) ~~The device of claim 3,~~ A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a floating gate operably positioned proximate to and separated from the channel region;

a control gate operably positioned proximate to and separated from the floating gate; and

<u>an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including a mixture of component oxides having varied concentrations to provide a composition gradient across the thickness and provide different barrier heights with respect to the floating gate and the control gate, the component oxides including at least one metal oxide;</u>

<u>wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the floating gate and the intergate insulator; and</u>

wherein the metal layer includes a metal corresponding to a metal of the metal oxide.

5. (Original) The device of claim 3, wherein the metal layer includes Al.

6. (Original) The device of claim 3, wherein the metal layer includes a titanium-zirconium (Ti/Zr) alloy.

7. (Original) The device of claim 1, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the control gate and the intergate insulator.

8. (Original) The device of claim 7, wherein the metal layer includes Al.

9. (Original) The device of claim 7, wherein the metal layer includes a noble metal.

10. (Original) The device of claim 1, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

11. (Currently Amended) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a polysilicon floating gate operably positioned proximate to and separated from the channel region by an oxide;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including a mixture of component metal oxides having varied concentrations to provide a composition gradient across the thickness and provide different barrier heights with respect to the floating gate and the control gate;

wherein the intergate insulator barrier height is lower at the floating gate and is higher at the control gate.

12. (Original) The device of claim 11, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the floating gate and the intergate insulator.

13. (Original) The device of claim 11, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the control gate and the intergate insulator.

14. (Original) The device of claim 11, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

15. (Currently Amended) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a polysilicon floating gate operably positioned proximate to and separated from the channel region by an oxide;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including transition metal oxides having varied concentrations to provide a composition gradient across the thickness and provide asymmetrical tunnel barriers with the floating gate and the control gate;

wherein the intergate insulator barrier height is lower at the floating gate and is higher at the control gate.

16. (Original) The device of claim 15, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

17. Currently Amended) ~~The device of claim 16,~~ A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a polysilicon floating gate operably positioned proximate to and separated from the channel region by an oxide;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including transition metal oxides having varied concentrations to provide a composition gradient across the thickness and provide asymmetrical tunnel barriers with the floating gate and the control gate;

a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions;

wherein the metal layer includes a metal corresponding to a metal of the metal oxide.

18. (Original) The device of claim 16, wherein the first metal layer includes Al.

19. (Original) The device of claim 16, wherein the first metal layer includes a titanium-zirconium (Ti/Zr) alloy.

20. (Original) The device of claim 16, wherein the second metal layer includes Al.

21. (Original) The device of claim 16, wherein the second metal layer includes a noble metal.

22. (Currently Amended) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a polysilicon floating gate operably positioned proximate to and separated from the channel region by an oxide;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including TiO_2 and ZrO_2 having varied concentrations to provide a composition gradient across the thickness and provide asymmetrical tunnel barriers with the floating gate and the control gate;

wherein the intergate insulator barrier height is lower at the floating gate and is higher at the control gate.

23. (Original) The device of claim 22, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the floating gate and the intergate insulator.

24. (Original) The device of claim 22, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the control gate and the intergate insulator.

25. (Original) The device of claim 22, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

26. (Currently Amended) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a polysilicon floating gate operably positioned proximate to and separated from the channel region by an oxide;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including TiO_2 and HfO_2 having varied concentrations to provide a composition gradient across the thickness and provide asymmetrical tunnel barriers with the floating gate and the control gate;

wherein the intergate insulator barrier height is lower at the floating gate and is higher at the control gate.

27. (Original) The device of claim 26, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the floating gate and the intergate insulator.

28. (Original) The device of claim 26, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the control gate and the intergate insulator.

29. (Original) The device of claim 26, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

30. (Original) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a polysilicon floating gate operably positioned proximate to and separated from the channel region by an oxide;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including ZrO_2 and HfO_2 having varied concentrations to provide a composition gradient across the thickness and provide asymmetrical tunnel barriers with the floating gate and the control gate.

31. (Original) The device of claim 30, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the floating gate and the intergate insulator.

32. (Original) The device of claim 30, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the control gate and the intergate insulator.

33. (Original) The device of claim 30, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

34. (Original) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a polysilicon floating gate operably positioned proximate to and separated from the channel region by an oxide;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including TiO_2, ZrO_2 and HfO_2 having varied concentrations to provide a composition gradient across the thickness and provide asymmetrical tunnel barriers with the floating gate and the control gate.

35. (Original) The device of claim 34, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the floating gate and the intergate insulator.

36. (Original) The device of claim 34, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the control gate and the intergate insulator.

37. (Original) The device of claim 34, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

38. (Original) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a polysilicon floating gate operably positioned proximate to and separated from the channel region by an oxide;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including Al_2O_3 and SiO_2 to provide a graded mixed oxide insulator, the Al_2O_3 and SiO_2 having varied concentrations across the thickness to provide a composition gradient across the thickness and provide asymmetrical tunnel barriers with the floating gate and the control gate.

39. (Original) The device of claim 38, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the floating gate and the intergate insulator.

40. (Original) The device of claim 38, wherein the floating gate includes a polysilicon floating gate, further comprising a metal layer positioned between the control gate and the intergate insulator.

41. (Original) The device of claim 38, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

42. (Currently Amended) A vertically-oriented device, comprising:

a pillar of semiconductor material;

a first source/drain region located in the pillar, a second source/drain region located in the pillar and positioned over the first source/drain region, and a channel region located between the first and second source/drain regions;

a floating gate operably positioned adjacent to and separated from the channel region along a side of the pillar;

a control gate operably positioned adjacent to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including a mixture of component oxides having varied concentrations across the thickness to provide a composition gradient across the thickness and provide different barrier heights at an interface with the floating gate and an interface with the control gate, the component oxides including at least one metal oxide;

wherein the intergate insulator barrier height is lower at the floating gate and is higher at the control gate.

43. (Original) The device of claim 42, wherein the component oxides include a mixture of TiO_2 and ZrO_2 in varied concentrations to provide the composition gradient across the thickness of the intergate insulator.

44. (Original) The device of claim 42, wherein the component oxides include a mixture of TiO_2 and HfO_2 in varied concentrations to provide the composition gradient across the thickness of the intergate insulator.

45. (Original) The device of claim 42, wherein the component oxides include a mixture of ZrO_2 and HfO_2 in varied concentrations to provide the composition gradient across the thickness of the intergate insulator.

46. (Original) The device of claim 42, wherein the component oxides include a mixture of TiO_2, ZrO_2 and HfO_2 in varied concentrations to provide the composition gradient across the thickness of the intergate insulator.

47. (Original) The device of claim 42, wherein the component oxides include a mixture of Al_2O_3 and SiO_2 in varied concentrations to provide the composition gradient across the thickness of the intergate insulator.

48. (Currently Amended) A horizontally-oriented device, comprising:

a substrate;

a first source/drain region and a second source/drain region located in the substrate, and a channel region located between the first and second source/drain regions;

a floating gate operably positioned over and separated from the channel region;

a control gate operably positioned over and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having a thickness and including a mixture of component oxides having varied concentrations to provide a composition gradient and provide different barrier heights at

an interface with the floating gate and at an interface with the control gate, the component oxides including at least one metal oxide;

wherein the intergate insulator barrier height is lower at the interface with the floating gate and is higher at the interface with the control gate.

49. (Original) The device of claim 48, wherein the component oxides include a mixture of TiO_2 and ZrO_2 in varied concentrations to provide the composition gradient across the thickness of the intergate insulator.

50. (Original) The device of claim 48, wherein the component oxides include a mixture of TiO_2 and HfO_2 in varied concentrations to provide the composition gradient across the thickness of the intergate insulator.

51. (Original) The device of claim 48, wherein the component oxides include a mixture of ZrO_2 and HfO_2 in varied concentrations to provide the composition gradient across the thickness of the intergate insulator.

52. (Original) The device of claim 48, wherein the component oxides include a mixture of TiO_2, ZrO_2 and HfO_2 in varied concentrations to provide the composition gradient across the thickness of the intergate insulator.

53. (Original) The device of claim 48, wherein the component oxides include a mixture of Al_2O_3 and SiO_2 in varied concentrations to provide the composition gradient across the thickness of the intergate insulator.

54. (Previously Presented) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a floating gate operably positioned proximate to and separated from the channel region;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having different tunnel barriers at an interface with the floating gate and at an interface with the control gate, the intergate insulator being formed using a process including performing a low temperature chemical vapor deposition of a mixture of TiO_2 and ZrO_2 to vary a composition of the mixture and provide a desired composition gradient across a thickness of the intergate insulator.

55. (Original) The device of claim 54, wherein the floating gate is separated from the channel region by a layer of SiO_2, the floating gate includes a polysilicon floating gate, and the control gate includes a polysilicon control gate.

56. (Original) The device of claim 55, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

57. (Previously Presented) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a floating gate operably positioned proximate to and separated from the channel region;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having different tunnel barriers at an interface with the floating gate and at an interface with the control gate, the intergate insulator being formed using a process including performing a low temperature chemical vapor deposition of a mixture of TiO_2 and HfO_2 to vary a composition of the mixture and provide a desired composition gradient across a thickness of the intergate insulator.

58. (Original) The device of claim 57, wherein the floating gate is separated from the channel region by a layer of SiO_2, the floating gate includes a polysilicon floating gate, and the control gate includes a polysilicon control gate.

59. (Original) The device of claim 58, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

60. (Previously Presented) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a floating gate operably positioned proximate to and separated from the channel region;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having different tunnel barriers at an interface with the floating gate and at an interface with the control gate, the intergate insulator being formed using a process including performing a low temperature chemical vapor deposition of a mixture of ZrO_2 and HfO_2 to vary a composition of the mixture and provide a desired composition gradient across a thickness of the intergate insulator.

61. (Original) The device of claim 60, wherein the floating gate is separated from the channel region by a layer of SiO_2, the floating gate includes a polysilicon floating gate, and the control gate includes a polysilicon control gate.

62. (Original) The device of claim 61, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

63. (Previously Presented) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a floating gate operably positioned proximate to and separated from the channel region;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having different tunnel barriers at an interface with the floating gate and at an interface with the control gate, the intergate insulator being formed using a process including performing a low temperature chemical vapor deposition of a mixture of TiO_2, ZrO_2 and HfO_2 to vary a composition of the mixture and provide a desired composition gradient across a thickness of the intergate insulator.

64. (Original) The device of claim 63, wherein the floating gate is separated from the channel region by a layer of SiO_2, the floating gate includes a polysilicon floating gate, and the control gate includes a polysilicon control gate.

65. (Original) The device of claim 64, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

66. (Previously Presented) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a floating gate operably positioned proximate to and separated from the channel region by an oxide;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having different tunnel barriers at an interface with the floating gate and at an interface with the control gate, the intergate insulator being formed using a process including

performing a sequential atomic layer deposition process to form layers of Al_2O_3 and layers SiO_2 with a predetermined thickness and arrangement to vary a composition of the mixture and provide a desired composition gradient across the thickness of the intergate insulator, wherein a region proximate to the floating gate includes more Al_2O_3 layers and fewer SiO_2 layers than a region proximate to the control gate.

67. (Original) The device of claim 66, wherein the floating gate is separated from the channel region by a layer of SiO_2, the floating gate includes a polysilicon floating gate, and the control gate includes a polysilicon control gate.

68. (Original) The device of claim 67, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.

69. (Currently Amended) A device, comprising:

a first source/drain region and a second source/drain region;

a channel region located between the first and second source/drain region;

a floating gate operably positioned proximate to and separated from the channel region by an oxide;

a control gate operably positioned proximate to and separated from the floating gate; and

an intergate insulator positioned between the floating gate and the control gate, the intergate insulator having different tunnel barriers at an interface with the floating gate and at an interface with the control gate, the intergate insulator being formed using a process including oxidizing metal alloy films to vary a composition of the mixture and provide a desired composition gradient across the thickness of the intergate insulator;

<u>wherein the intergate insulator barrier height is lower at the floating gate and is higher at the control gate</u>.

70. (Original) The device of claim 69, wherein oxidizing metal alloy films includes oxidizing transitional metal alloy films.

71. (Original) The device of claim 69, further comprising a first metal layer positioned between the floating gate and the intergate insulator, and a second metal layer positioned between the control gate and the intergate insulator, wherein the first metal layer and the second metal layer have different work functions.